

EM-RFO--KHLL-D&DOPS-2004-0003 FINAL

Deactivation & Decommissioning Ops
(Name of Facility)

Balance of Plant - Infrastructure (Other Functions not specifically listed in this
Category)
(Facility Function)

Rocky Flats Env. Technology Site Kaiser-Hill Company, L.L.C.
(Site) (Contractor)

Name: J.R. Marschall
Title: Facility Manager **Telephone No.:** (303) 966-2372
(Facility Manager/Designee)

Name: FOSTER, KIRK B
Title: Telephone No.: (303) 966-6466
(Originator/Transmitter)

Name: C. Freiboth **Date:** 04/22/2004
(Authorized Classifier (AC))

1. Occurrence Report Number: EM-RFO--KHLL-D&DOPS-2004-0003

Declaration of Operational Emergency Alert-Star: Fire Department Response
to Report of Smoke From B991

2. Report Type and Date: FINAL

	Date	Time	
Notification:	02/13/2004	19:46	(ETZ)
Initial Update:	03/17/2004	19:02	(ETZ)
Latest Update:	04/22/2004	17:45	(ETZ)
Final:	12/16/2004	12:45	(ETZ)

3. Significance Category: OE

4. Division or Project: Kaiser-Hill Company, LLC.

5. Secretarial Office: EM - Environmental Management

6. System, Bldg., or Equipment: Bldg. 991

7. UCNI?: No

8. Plant Area: RISS

9. Date and Time Discovered: 02/12/2004 12:42 (MTZ)

10. Date and Time Categorized: 02/12/2004 13:32 (MTZ)

11. DOE HQ OC Notification:

Date	Time	Person Notified	Organization
02/12/2004	13:43 (MTZ)	Robert Turner	DOEHQ

12. Other Notifications:

Date	Time	Person Notified	Organization
02/12/2004	13:43 (MTZ)	Deanna McCranie	DOERFO

13. Subject or Title of Occurrence:

Declaration of Operational Emergency Alert-Star: Fire Department Response to Report of Smoke From B991

14. Reporting Criteria:

1(2) - An Alert, as defined in DOE O 151.1A, Chapter 5, Paragraph 3a.

4B(7) - A facility or site stand-down resulting from safety reasons reportable as an occurrence or occurrences.

Note: This is a secondary reporting criterion, and does not require a separate occurrence report.

15. Description of Occurrence:

On Thursday, February 12, 2004, at 1332 hours, an Alert-Star Operational Emergency (OE) was declared due to evidence of combustion taking place in Room 402 of Building 991. Nearby workers observed smoke emitting from small conduit penetrations above the exterior door to Room 402 at 1242 hours and immediately notified the Fire Department. Room 402 was not accessible to confirm the nature or extent of the combustion because the facility is being prepared for demolition and the room was recently sealed and access was not possible. As a result of the observed smoke and inability to access the facility to identify and eliminate the source of the smoke, Facility Management determined that this event satisfied the conditions for entry into an Alert-Star OE. The Alert-Star designation represents degradation in the level of safety at a site/facility that requires response efforts from outside the site/facility. It falls below the protective action criteria for an Alert and does not require further classification as specified in DOE Order 151.1A.

Background

At the time of the event, Building 991 was in the final stages of preparation for demolition and was not occupied. Preparation for demolition included the application of an industrial use foam agent to fill the voids of selected underground rooms and tunnels that were to remain in place following demolition of the building. The purpose of the foaming operation in Building 991 was to minimize any future slumping of the ground above the structure and to make these areas inaccessible should they become uncovered in the future. The foam was applied to several areas of the facility resulting in relatively large volumes (e.g. dimensions of one of the larger areas was 12 feet wide x 12.5 feet high x 18 feet deep). The application of foam in these areas was conducted between February 2 and February 5, 2004. Foaming operations were completed about one week before the observation of smoke by workers in the area. The foamed areas included Room 402, a tunnel entrance immediately to the west of Room 402 (West B tunnel), a tunnel connecting Corridor B to Building 991 (East B tunnel), and a tunnel connecting Corridor A to Building 991. (The investigation revealed that only the West B tunnel foam burned).

The foam was a polyurethane foam agent (Autofroth 9453) manufactured by BASF. Mixing two materials (Isocyanate and resin) creates the foam agent through the use of specially designed application equipment and with specific operational controls and procedures. The mixing results in an exothermic chemical reaction resulting in significant heat generation. Combining this exothermic property with the scope of the application (i.e., the large mass), the excellent insulation properties of the foam, and the failure to follow vendor specified application controls to accommodate the heat generation; an excessive build-up of heat was created in the foam.

The typical application for Autofroth 9453 is insulation for walk-in coolers. It is typically applied between two surfaces of known temperature, with the final thickness being under a few inches. The RFETS interest in using it has been as a cribbing material for waste loaded into cargo containers for transportation and disposal, and as a fill material in glove boxes prior to disposal. Because of the larger foam volumes in the RFETS applications, adjustments were made in the application process to "fill" the cargo containers and glove boxes. BASF developed a methodology to maximize the opportunity for proper heat dissipation of the heat generated during the exothermic reaction to minimize the hazardous potential for burning, smoking, and charring of the foam. The recommendation was to apply the foam such that it expanded to no greater than 24 inches thick (defined as a "lift") followed by a minimum cure time of 90 minutes before additional foam was applied. This approach allowed sufficient heat removal to avoid burning of the foam.

Event Details

On February 12, 2004, a small crew of workers led by a Project Industrial Hygiene (IH) Support Specialist was preparing to remove waste drums from Building 991. The workers noticed an unusual odor and requested the IH Specialist to investigate. The IH Specialist observed a haze at the far west end of a corridor in the facility. The same individual then went outside and approached the south side of the facility near the loading dock. The individual observed wisps of light-green smoke coming out of several small conduit penetrations above Door #6 on the exterior south side of Room 402.

The RFETS Fire Department was notified of the observation of smoke at the facility at 1242 hours and responded to the scene at 1247 hours. The area was secured and placed under positive access control. Fire Department personnel in Self-Contained Breathing Apparatus (SCBA) gear introduced water into Room 402 through the penetrations above the door. This action proved to be effective in limiting the amount of smoke observed. Fire Fighters equipped with SCBA entered Building 991 and staged a fan to remove accumulated smoke from the hallway.

Facility Management determined that as a result of the observed smoke and the inability to access the facility to identify and eliminate the source, the conditions were met for entry into an Alert-Star Operational Emergency (OE). An Alert-Star OE was declared at 1332 hours due to evidence of combustion taking place in Room 402 of Building 991. The Site Emergency Operations Center (EOC) was activated at the Crisis Support Staff level and actions required by the RFETS Emergency Plan were executed. Technical Support organizations were deployed as necessary in accordance with Site procedures.

Communications with the foam manufacturer (BASF) and the vendor (InstaCote) were established to assist in developing response actions. Air and fire wastewater monitoring was instituted promptly following initiation of the event and continued throughout the event. Following appropriate response to place the area in a safe condition, the circumstances prompting entry into the OE were exited and the Alert-Star OE was terminated at 1702 hours on February 12, 2004.

There were no injuries to plant personnel or exposures to radiological or hazardous material during the course of this event. No radioactive material was present in the facility or released during this event. As a precaution, affected personnel underwent medical evaluations to determine if there were potential exposures to hazardous chemicals. Results of blood testing were negative for all individuals involved.

Recovery actions verified that only the foam applied in the West B tunnel had undergone combustion and that the fire self extinguished by February 24, 2004.

16. Is Subcontractor Involved? No

17. Operating Conditions of Facility at Time of Occurrence:

Facility Out of Commission

18. Activity Category:

11 - Facility Decontamination/Decommissioning

19. Immediate Actions Taken and Results:

The Rocky Flats Fire Department promptly responded to the scene and the area was secured with appropriate access control measures instituted. The EOC was activated and actions required by the RFETS Emergency Plan were executed. Air and water perimeter monitoring was initiated to verify workers, the public, and the environment were safe. All foaming operations were suspended at the Site.

20. ISM:

- 1) Define the Scope of Work
- 2) Analyze the Hazards
- 3) Develop and Implement Hazard Controls
- 4) Perform Work Within Controls

21. Cause Code(s):

A4B3C08 - Management Problem; Work Organization & Planning LTA; Job scoping did not identify special circumstances and/or conditions A4B3C11 - Management Problem; Work Organization & Planning LTA; Inadequate work package preparation A6B3C03 - Training deficiency; Training Material LTA; Training on new work methods LTA

22. Description of Cause:

The cause of the fire was an incorrect application process in which heat generated from the foam curing process did not dissipate as required to avoid developing extremely high temperatures in the foam. The hazards associated with using the foam in an application for which it was not designed were not properly addressed. In this instance, the scope and hazards changed as foaming agent was applied in increasingly larger volumes over time. This was not clearly recognized by either the Subject Matter Expert or the crew. Because of the larger foam volumes in the Building 991 application, adjustments were made in the application process that had been successfully used prior to this event during the filling of cargo containers and glove boxes. The vendor developed a methodology to ensure proper heat dissipation during the exothermic reaction in order to

eliminate the hazardous potential for burning, smoking, and charring of the foam. The vendor recommended a limited application of foam where expansion did not exceed a 24-inch lift, followed by a minimum cure time of 90 minutes before application of additional foam. This approach was designed to allow sufficient heat removal to avoid burning of the foam during curing. The scope of foaming operations, the significant increase in volume of foam needed in the tunnels and rooms in Building 991, and the application and curing requirements not fully appreciated by the crew, foreman, or SME, led to the fire.

The investigation revealed that the application of the foam in the tunnels and Room 402 did not comply with the manufacturer's recommendation (24-inch lift followed by 90 minute cure time). Those recommendations were not adequately incorporated in the work document, which was highly dependent upon SME knowledge and direction. Large volumes of foam in Building 991 were essentially formed by a near continuous pour. Because the foam has excellent insulating properties, the heat generated during the exothermic reaction could not be dissipated before reaching combustion temperatures. The work package used for this evolution did not comply with the Site Integrated Work Control Program (IWCP) process and contributed to the cause of the fire.

Additionally, the incorrect application process used by the work crew in Building 991 contributed to the splitting of the foam that created voids and allowed oxygen to reach areas of heat build-up, providing conditions necessary for continued combustion. Incorrect mixing of the two-part foam may have led to hot spots in the foam that would have increased the potential for combustion to occur.

Training requirements for foaming operations include both formal classroom and On-the-Job training prior to performing foaming activities. A review of the work crew's training records show that out of nine individual assigned to this task (including workers, foreman, and SMEs) only one SME and one worker were fully trained and qualified to perform foaming operations. Others received some form of the training requirements; however, there was an obvious failure to adequately train and qualify foaming operations personnel.

23. Evaluation (by Facility Manager/Designee):

There were no injuries or chemical exposures to personnel as a result of this occurrence. Damage to the facility was limited to the foam located in one area of the building. The facility had met all free release criteria for radiological and hazardous materials prior to this event in preparation for the scheduled demolition.

A diverse team of experts conducted an Independent Investigation of the Building 991 Fire and results were included in a report issued on March 18, 2004. Results of the investigation included a determination of causal factors, review of incident response actions and recommendations for improvements.

In order to close RFETS in an accelerated manner, a number of management challenges must be overcome due to the complexity and unique challenges presented by a closure project of this magnitude. In order to accomplish this objective, management is often confronted with unique challenges requiring the use of new and innovative practices to safely and effectively accomplish mission goals and objectives. The utilization of foaming as a means of bracing and stabilization is a clear example of the use of "innovative" practices needed to close the Site. While these innovations provide a mechanism for accomplishing one-of-a-kind work challenges, these same innovative practices require an increased level of review with an analysis of the hazards and risks so that appropriate controls can be employed to prevent unsafe conditions and negative impacts.

Actual building demolition commenced on March 9, 2004. The areas where foam had burned were excavated and discarded as waste. In areas of concern, the void spaces will be filled with soil to prevent future slumping.

A series of events at the Site, including the Building 371 Glovebox Fire (RFO-KHLL-371OPS-2003-0011), identified specific weaknesses in areas of work control, hazard identification and controls, and work planning/organization that can also be related to this event. In response to these previously identified issues, Kaiser-Hill promulgated a Sitewide Comprehensive Corrective Action Plan on March 24, 2004. The corrective actions included in the comprehensive plan were ongoing when the Building 991 event occurred and continues to be addressed at the Site level. In addition to the specific corrective actions identified in this report, the comprehensive corrective action plan will provide added improvements in the identified areas of weakness.

The due date for this occurrence report was extended to April 22, 2004. This extension allowed for a thorough and complete causal investigation of the event and determination of appropriate corrective actions.

24. Is Further Evaluation Required?: No

25. Corrective Actions

(* = Date added/revised since final report was approved.)

1. Establish a Recovery Team and develop a recovery plan for exiting the Alert-Star and establish ongoing monitoring of the facility condition.

Responsible Manager: D. Snyder

Target Completion Date: 02/12/2004 **Completion Date:** 02/12/2004

2. Provide blood screening and medical evaluation for potential hazardous materials exposure to affected personnel. Responsible Manager: J. McInerney

Target Completion Date: 02/24/2004 **Completion Date:** 02/24/2004

3. Develop a restart plan for foaming operations which addresses scope, work control documents, training/qualification requirements, technical specifications, hazards and hazard controls, product limitations, interfaces with existing work, and quality assurance and oversight requirements. Responsible Manager: D. Snyder

Target Completion Date: 03/18/2004 **Completion Date:** 03/18/2004

4. Conduct an independent investigation of the fire in Building 991 including causal determination and applicable recommendations. Responsible Manager: A. Geis

Target Completion Date: 03/18/2004 **Completion Date:** 03/18/2004

5. Develop a Lessons Learned document for this event. Responsible Manager: R. Plappert

Target Completion Date: 04/12/2004 **Completion Date:** 04/12/2004

26. Lessons Learned:

Fire can result from the incorrect application of an exothermic foaming agent when site procedures and material specifications are not followed. When evaluating new or existing technologies for innovative uses, ensure that all technological considerations are thoroughly examined in light of the intended use. Ensure that a thorough hazard evaluation is performed, with particular attention given to the potential for new or different hazards arising from the use of a product in an application different from its original intent. Avoid reliance on technical experts at the expense of proven work control processes, and ensure rigorous training and qualification commensurate with the innovation is conducted. Conduct a formal management review prior to implementation to ensure sufficient management scrutiny has been applied and that all technical considerations have been fully evaluated.

27. Similar Occurrence Report Numbers:

ORO-BNFL-K31-2001-0004 ORO-BNFL-K33-2005-0005 ID-BNFL-AMWTF-2003-0008

28. User-defined Field #1:

040022

29. User-defined Field #2:

04/22/2004

30. HQ Keyword(s):

03C--Fire Protection and Explosives Safety - Fire/Explosion 11A--Other - Chemical Reaction/Pressurized Drum 12F--EH Categories - Fire Protection 13A--Management Concerns - HQ Significant (High-lighted for Management attention) 13F--Management Concerns - Operating Experience Summary Article

31. HQ Summary:

Site personnel declared an Alert-Star Operational Emergency due to evidence of combustion taking place in Room 402 at Building 991 (plant personnel observed smoke coming out of small penetrations above the exterior door of Room 402). Fire Department personnel responded to the scene. Since the room had been filled with a polyurethane foam agent prior to the combustion event, both to restrict personnel access and in preparation for building demolition, site personnel speculate that the smoke was caused by a chemical/exothermic reaction that is part of the foam's curing process. The only combustible materials in the subject areas are small amounts of wood and plastic sheeting which were used to erect walls to contain the foam. Fire water was introduced into Room 402, and was effective in controlling the amount of smoke observed. As a precaution, Fire Department personnel are undergoing blood evaluations by the site medical department to determine if there have been any hazardous material exposures. Site personnel have instituted air and water monitoring. Following these actions, the Alert-Star Operational Emergency was terminated.

32. DOE Facility Representative Input:

33. DOE Program Manager Input: Approved by Terry Krietz for Patty Bubar per memorandum dated December 16, 2004

Entered by: MCMILLAN, JEFFREY T Date: 12/16/2004

34. Approvals:

Approved by: J.R. Marschall, Facility Manager/Designee
Date: 04/22/2004
Telephone No.: (303) 966-2372

Approved by: MCCRANIE, DEANNA C, Facility
Representative/Designee
Date: 04/30/2004
Telephone No.:

Approved by:
Manager/Designee
Date: 12/16/2004
Telephone No.:

MCMILLAN, JEFFREY T, Program